INSTRUCTIONS

MODEL **CK2**

INVERTED MICROSCOPE

WARNING

This instruction manual is for use of the Inverted Microscope Model CK2. Before putting the microscope into operation, we recommend you read this manual carefully in order to familiarize yourself fully with the use of this microscope so that you may obtain optimum performance.

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BEFORE USE

1 Operation

① As a microscope is a **precision instrument**, always handle it with the care it deserves and **avoid abrupt motions** and **shocks**.

② When you remove the microscope from the styrofoam case, hold the stage legs at Ⓐ and Ⓑ. (Fig. 1)

③ For movement of the microscope, hold the stage leg Ⓐ and the observation tube Ⓒ. Do not hold the lamp housing pillar. (Fig. 1)

④ The light source incorporates a 6 V 20 W halogen bulb. Do not use any other bulb.

⑤ **Avoid** exposure of the microscope to **direct sunlight**, high **temperature** and **humidity**, **dust** and **vibration**.

⑥ Before use, ascertain that the line voltage selector switch at the base plate of the microscope stand is set in conformity with the local line voltage.

★ **Specifications of the electrical components differ from others than the equipment with 120 V of supply circuit, as the equipment is in compliance with the requirements of Underwriters Laboratories. Also, the equipment is not needed to select voltage.**

⑦ Before fuse replacement, disconnect the power cord from the AC outlet. The fuse box ① is located at the back of the microscope stand. (Fig. 2)
Use a screwdriver to remove this box.

⑧ Always **ground** the microscope.

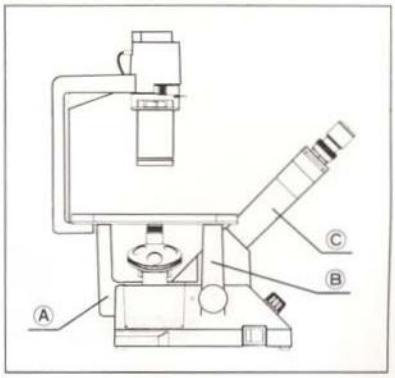

Fig. 1

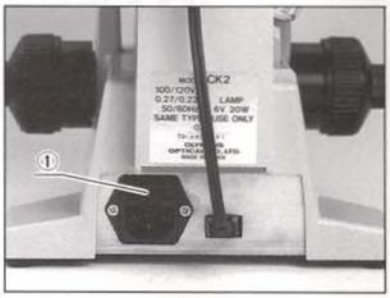

Fig. 2

2 Maintenance and storage

① Lens surfaces must always be kept clean. Fine dust on lens surfaces should be blown off by means of hand blower. Carefully wipe off oil or fingerprints on the lens surfaces with gauze moistened with a **small** amount of alcohol and ether (3 : 7) mixture, or xylene.

② Do not use organic solutions to wipe the surfaces of various components. Plastic parts, especially, should be cleaned with a neutral detergent.

③ Be careful not to spill the culture solution, etc. If spilled, it should be wiped off immediately.

④ When objectives are not screwed into the nosepiece apertures, seal the apertures with dust plugs, which will protect the lenses located in the lower light path from dust, culture solution, etc.

⑤ When not in use, the microscope should be covered with the dust cover provided.

⑥ A tension adjustment ring ① is provided next to the coarse focus adjustment knobs. With this device the tension of the coarse adjustment is freely adjustable for either heavy or light movement, depending upon operator preference. (Fig. 3)
Applying the tip of a large screwdriver at a groove in the periphery of the tension adjustment ring ①, rotate the ring in the direction of the arrow to increase the tension, or reverse the ring to loosen.
However, do not loosen the tension adjustment ring too much, because this may cause the fine focus adjustment knobs to slip.

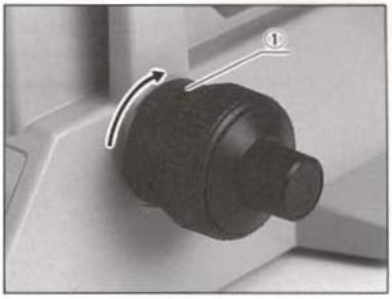

Fig. 3

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1 SPECIFICATIONS

Item	Description		
Focus adjustment	Focus adjustment by vertical movement of the nosepiece (stage is fixed) by means of the coarse/fine adjustment knobs, provided with tension adjustment mechanism. Focusing range (from the focal point on the stage surface): 6 mm upward and 2 mm downward.		
Nosepiece	Quadruple, with provision for mounting a simple filter analyzer.		
Stage	160 mm (X) x 240 mm (Y). Substage: 70 mm (X) x 180 mm (Y).		
Attachable mechanical stage	Traversing area: 120 mm (X) x 78 mm (Y); coaxial low drive control knobs on the right or left side of the plain stage; provided with 2 culture vessel holders.		
Illumination	Light source	6 V 20 W halogen bulb	
	Light intensity control	Continuously variable by resistor	
	Filter holder	For 45 mm-dia. filters.	
	Built-in filter	Frosted, heat absorbing filter	
	Condenser	Ultra long-working distance condenser N.A. 0.3, W.D. 72 mm; detachable.	
Optics for observation	Afocal optical system.		
Binocular tube	Inclined 45°; interpupillary distance adjustment range 53 through 72 mm; with a diopter adjustment helicoid on the left sleeve.		
Trinocular tube	Inclined 45°; interpupillary distance adjustment range 53 through 72 mm; with diopter adjustment helicoid on both sleeves.		
Light annulus slider	Provided with accommodation for 3 annuli, including one annulus for 10X (also used for 20X) objective and two annuli for 4X and 40X objectives; detachable.		
Objectives	For phase contrast	PC S Plan 4XPL PC D10XPL PC LWD CD 20XPL PC LWD CDPlan 40XPL	N.A. 0.13; W.D. 15.5 mm N.A. 0.25; W.D. 7.2 mm N.A. 0.40; W.D. 5.4 mm N.A. 0.60; W.D. 1.9 mm (correction collar)
	For bright field	D4X D10X LWD CD20X	N.A. 0.10; W.D. 18.2 mm N.A. 0.25; W.D. 7.2 mm N.A. 0.40; W.D. 5.4 mm
Dimensions	200 mm (W) x 340 mm (D) x 469 mm (H)		
Eyepoint height	Binocular tube: 342 mm (13.5 in.). Trinocular tube: 332 mm (13.3 in.)		
Weight	About 7 kg (15.4 lb.)		

2 STANDARD CONFIGURATIONS

Component \ Model			CK2-BIP		CK2-BIC		CK2-TRP		CK2-TRC	
			-1	-2	-1	-2	-1	-2	-1	-2
Microscope stand with fixed binocular tube, including CK2-ULWCD condenser		CK2BI-F	○	○	○	○				
Microscope stand, including CK2-ULWCD condenser		CK2TR-F					○	○	○	○
Trinouclar tube		BH-TR45-W					○	○	○	○
Stage extension plates		CK2-SS	○ (2 pcs)	○ (2 pcs)	○	○	○ (2 pcs)	○ (2 pcs)	○	○
Attachable mechanical stage		CK2-MVR			○	○			○	○
Halogen lamp socket		LS20HM	○	○	○	○	○	○	○	○
Halogen bulbs (2 pcs)		6V20WHAL	○	○	○	○	○	○	○	○
Power cord		UYCP	○	○	○	○	○	○	○	○
Objectives	D4X		○		○		○		○	
	D10X		○		○		○		○	
	PCSPlan 4XPL			○		○		○		○
	PCD10XPL			○		○		○		○
	LWDCD20XPL			○		○		○		○
	LWDCD20X						○		○	
	LWDCDPlan40XPL							○		○
Phase slider*		CK2-SL		○		○		○		○
Phase annular ring for 40X objective		CK2-RS40						○		○
LB centering telescope		CT-5		○		○		○		○
LB eyepiece 10X (2 pcs.)		CWHK10X	○	○	○	○	○	○	○	○
LB photo eyepiece 5X		NFK5XLD					○	○	○	○
Filter set**		PM-FIL-7					○	○	○	○

Note: ○ indicates the compatible components for each model.
*With annuli for 4X and 10/20X objectives. **Incl. 45LBD2N & 43ND25-W45 filters.

Optional Accessories

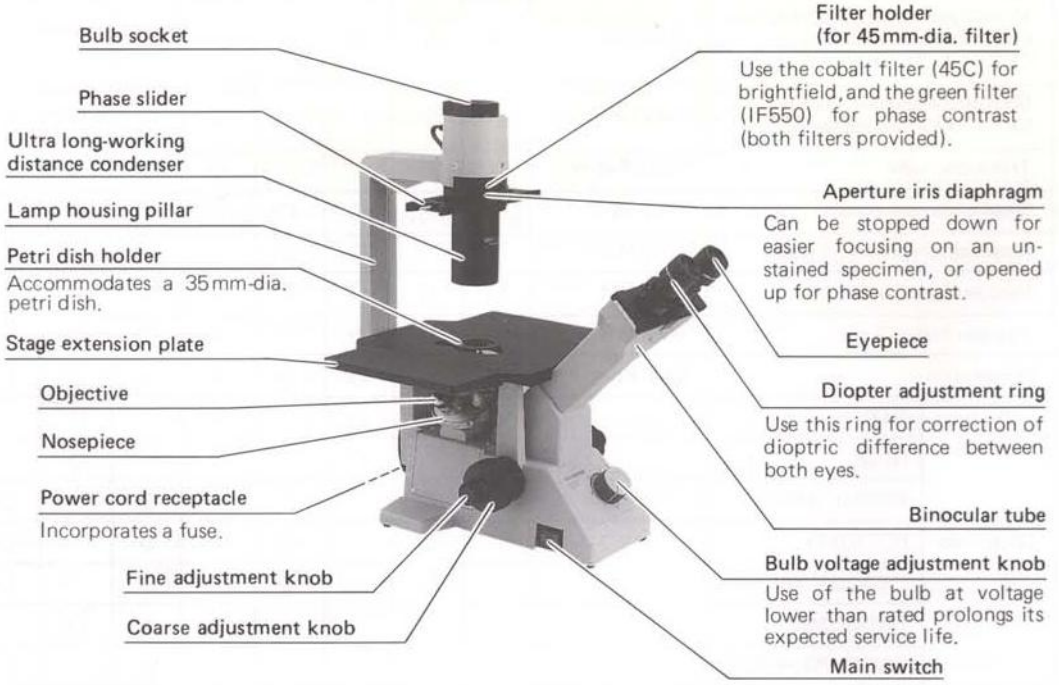
Attachable mechanical stage	IMT2-MVR
Objective	PC ULWDCD Plan 40XPL
Eyepieces	WHK10X & WHK15X

(For exclusive use with CK2-TRP/-TRC)

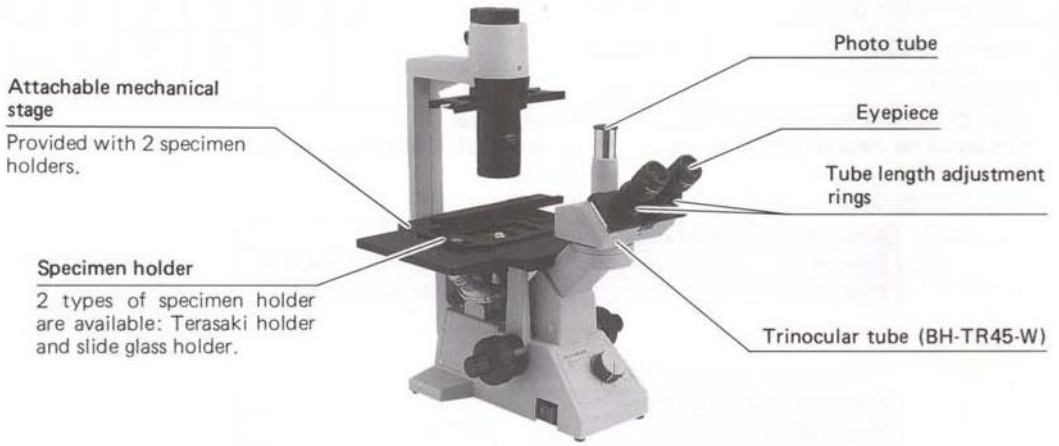
Photomicrographic system	PM-10
Magnification changer	BH2-CA
Drawing attachment	BH2-DA

3 NOMENCLATURE

CK2-BIP/-BIC


Bulb socket
Phase slider
Ultra long-working distance condenser
Lamp housing pillar
Petri dish holder
Accommodates a 35mm-dia. petri dish.
Stage extension plate
Objective
Nosepiece
Power cord receptacle
Incorporates a fuse.
Fine adjustment knob
Coarse adjustment knob
Filter holder (for 45mm-dia. filter)
Use the cobalt filter (45C) for brightfield, and the green filter (IF550) for phase contrast (both filters provided).
Aperture iris diaphragm
Can be stopped down for easier focusing on an unstained specimen, or opened up for phase contrast.
Eyepiece
Diopter adjustment ring
Use this ring for correction of dioptric difference between both eyes.
Binocular tube
Bulb voltage adjustment knob
Use of the bulb at voltage lower than rated prolongs its expected service life.
Main switch

CK2-TRP/-TRC


Attachable mechanical stage
Provided with 2 specimen holders.
Specimen holder
2 types of specimen holder are available: Terasaki holder and slide glass holder.
Photo tube
Eyepiece
Tube length adjustment rings
Trinocular tube (BH-TR45-W)

4 OPERATION

4-1 Assembly and Operation of Each Component

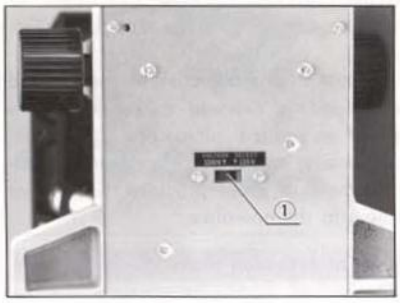


Fig. 4

1 Setting the line voltage selector switch

Set the line voltage selector switch ① located at the base plate of the microscope stand to the local line voltage (Fig. 4 shows the setting of the switch at 100V).

★ For the U.S.:
Frames sold in the U.S. meet the UL standard and are set at 115V. Therefor, this selector switch is not included.

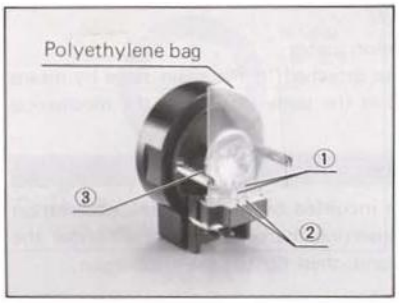


Fig. 5

2 Installing the halogen bulb

★ If the halogen bulb burns out during operation, wait until the defective bulb and socket are completely cooled before bulb replacement to prevent a burn.

1) Pull out the contact pins of the halogen bulb from the polyethylene bag.
Be certain not to leave fingerprints or smudges on the bulb.

2) Insert the contact pins ① completely into the socket ②. (Fig. 5)
★ Never use excessive force to twist or bend the bulb, but gently push in the pins.
★ Do not leave fingerprints, etc. on the mirror surface ③. If smudged, it should be wiped with gauze moistened with a small amount of alcohol and ether (3:7) mixture. (Fig. 5)

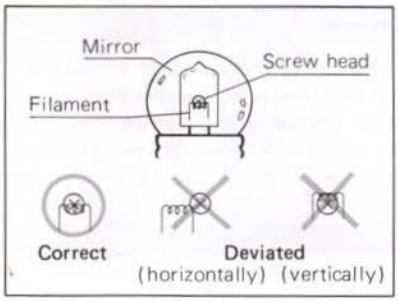


Fig. 6

3) Looking at the bulb from its front direction, ascertain that the lower half of the screw head on the mirror surface is covered by the filament. (Fig. 6)
★ If the filament deviates horizontally from the center of the screw head, the bulb tilts to the right or left. Attach the bulb again perpendicularly. (Fig. 6)
★ If the filament deviates vertically, the contact pins are not inserted completely. Push in the pins completely. (Fig. 6)

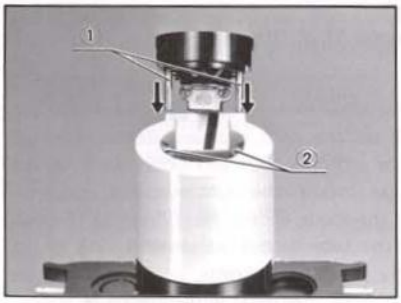


Fig. 7

3 Attaching the bulb socket

Aligning the guide pins ① to the guide holes ② of the lamp housing, slowly insert the bulb socket completely without tilting. (Fig. 7)

Fig. 8

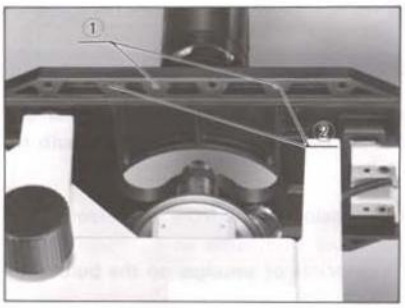


Fig. 9

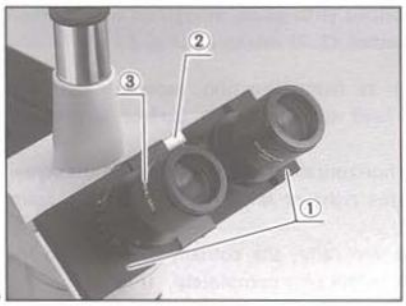


Fig. 10

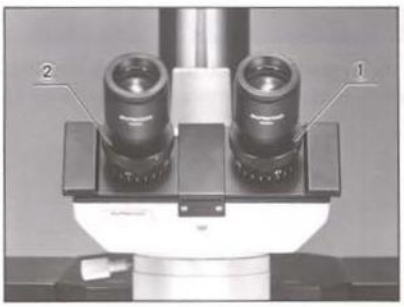


Fig. 11

4 Mounting the objectives

Screw each objective into the nosepiece ① from low power to high power, rotating the nosepiece in a clockwise direction. (Fig. 8)

★ **Please note that the front lens of the objective in the inverted microscope faces upward, and is exposed to contamination more than the objective of an upright microscope. Therefore, clean the front lens occasionally, and if there are empty openings in the nosepiece, use the dust plugs provided to prevent dust or debris from falling into the nosepiece.**

5 Attaching the mechanical stage or extension plates

1) Connecting the mechanical stage
Screw the mechanical stage to the right or left side of the plain stage with clamping screws ① provided at the underside of the stage. Tighten with a coin. (Fig. 9)

2) Connecting the stage extension plates
The extension plates can be attached to the plain stage by means of the clamping screws ② in the same manner as the mechanical stage.

6 Mounting the trinocular tube

The trinocular tube can be mounted by loosening the observation tube clamping knob and inserting the circular dovetail under the tube into the microscope stand; then tighten the knob again.

7 Inserting the eyepieces

Insert the eyepieces into the observation tube.

8 Interpupillary distance adjustment

Hold the knurled sliding grips ① of the right and left eyepiece sleeves with both hands and push the tubes together or pull them apart laterally while looking through the eyepieces with both eyes, until perfect binocular vision is obtained. If you know your interpupillary distance setting, set it at the scale ② between the eyepiece sleeves. (Fig. 10)

9 Diopter adjustment

1) Binocular tube
Look at the image through the right eyepiece with your right eye and focus on the specimen with the focus knobs. Next, looking at the image through the left eyepiece with your left eye, rotate the diopter adjustment ring ③ to focus on the specimen without using the focus knobs. (Fig. 10)

2) Trinocular tube
After interpupillary distance adjustment in step 8, rotate the tube length adjustment ring ① on the right eyepiece sleeve to match your interpupillary distance setting which you obtained from the scale. Looking at the image through the right eyepiece, focus on the specimen by means of the focus knobs. Next, looking through the left eyepiece, rotate the tube length adjustment ring ② to focus on the specimen. By these adjustments, parfocality can be maintained when objectives are changed, with touch-up adjustment if necessary. (Fig. 11)

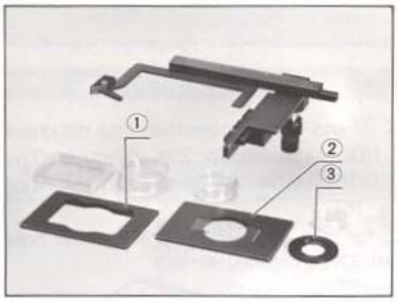
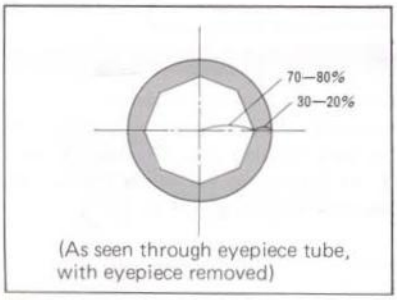


Fig. 12



(As seen through eyepiece tube, with eyepiece removed)

Fig. 13

Fig. 14

10 Use of the mechanical stages

1) A Terasaki holder ① is optionally available to hold a Terasaki plate or a 65mm-dia. petri dish; while an optional slide glass holder ② can be used to hold a 1" x 3" slide glass or a 54mm-dia. petri dish on the stage. (Fig. 12)

2) A 96-well micro-titre plate or a 24-well micro-titre plate can be directly mounted on the stage. (Fig. 12)

★ **The 35 mm-dia. petri dish holder ③ provided is used to prevent a specimen vessel from falling through the opening in the plain stage. (Fig. 12)**

11 Aperture iris diaphragm

An aperture iris diaphragm built in the illuminator is used to limit the angular aperture of an objective in brightfield, and controllable to obtain optimum objective performance, depending upon focal length, contrast and resolution. The opening of the aperture iris diaphragm should be matched to the N.A. of the objective in use. It is often preferable, however, to stop down the aperture diaphragm to about 70% through 80% of the objective N.A. (Fig. 13)

★ **An unstained specimen can be more easily observed with a stopped-down aperture in bright field.**

12 Setting of the correction collar

An inverted microscope is conveniently arranged to observe specimens contained in vessels of various bottom thicknesses. In order to achieve optimum objective performance of the inverted microscope, the high N.A. objectives are provided with a correction collar ①. (Fig. 14)

The correction collar is effective with a vessel bottom from 0 to 2mm thickness.

1) If the thickness of the vessel bottom is known:
Match the correction collar to the thickness of the vessel bottom by the collar scale provided.

2) If the thickness of the vessel bottom is unknown:
The optimum position for the correction collar can be obtained from the image resolution. After focus adjustment, if a satisfactory sharp image is not obtained, rotate the correction collar to the right and left so that you can compare the images at both sides. Reset the collar to the better image, then starting from this position, further rotate the collar to the right and left until both images can be obtained for comparison with each other. As you repeat this procedure several times, you can find best position for the correction collar. Refocus after rotating the correction collar.

13 Filters

Optimum selection of filters enhances the effective performance in observation and photomicrography.

No.	Filter		Purpose
1	Interference (green)	45-IF550	Enhances phase contrast images.
2	Neutral density (gray)	43ND25-W45	Reduces light intensity without changing spectral characteristics of the light source.
3	Light balancing	45-LBD-2N	For color photomicrography with daylight film.
4	Heat absorbing	45-HA*	Absorbs heat waves from the light source to protect the specimen.

★ **This filter is built in the CK2. It is recommended to add a second heat absorbing filter for prolonged observation or time-lapse photography of tissue cultures, etc.**

4-2 Phase Contrast Observation

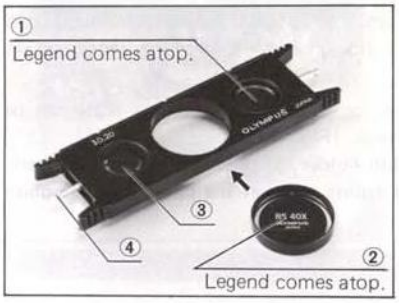


Fig. 15

1 Preparation of the phase slider

Put the light annuli for 4X ① and 40X ② objectives into the phase slider. The annulus ③ for 10X is also used for 20X objectives. The annuli for 4X and 10X (20X) objectives are centered by means of the centering lever ④. (Fig. 15)
Mount the light annulus ② for 40X objective into the center hole of the phase slider (as the ARROW indicates).

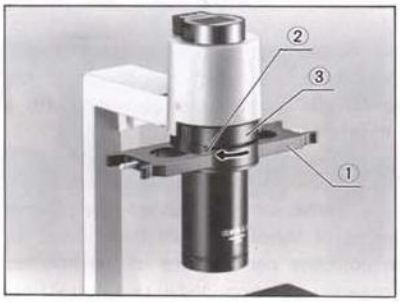


Fig. 16

2 Insertion of the phase slider

Insert the phase slider ① into the slot in the condenser in such a manner that its engraved surface with figures faces upward, and the notched side toward the lamp housing pillar. Rotate the aperture iris diaphragm lever ② all the way to the left, and insert the green filter provided into the filter mount ③. (Fig. 16)

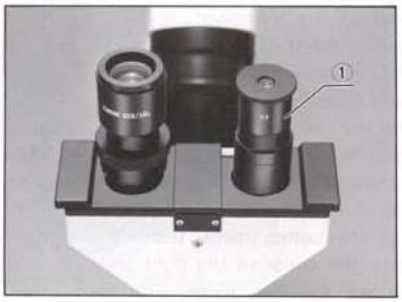


Fig. 17

3 Centration of the light annuli

1) Place a specimen on the stage and focus on it.
Remove one of the eyepieces from the observation tube and insert the centering telescope CT-5 ① provided into the observation tube. (Fig. 17)

Ascertain that objective magnification and annular ring are matched.
Rotate the top lens assembly of the centering telescope to bring the bright ring (light annulus) and the dark ring (phase annulus) into focus.
Operate the centering lever of the light annulus until both annuli are concentric and superimposed. (Fig. 18)

★ **If a specimen slide or the bottom surface of a culture vessel is not flat, either annulus is likely to slip off the center while centering the other. In such a case, repeat centering adjustment again. This trouble, however, rarely occurs with higher magnifications, so that the 40X phase annulus needs no centering adjustment.**

2) After centering adjustment with the 10X objective, check the centration with the 20X objective.

3) After centration is complete, remove the CT-5 and insert the eyepiece back into the observation tube.
Now it is ready for phase contrast observation.

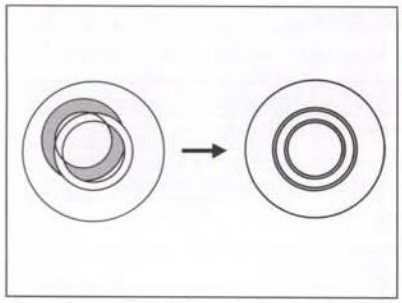
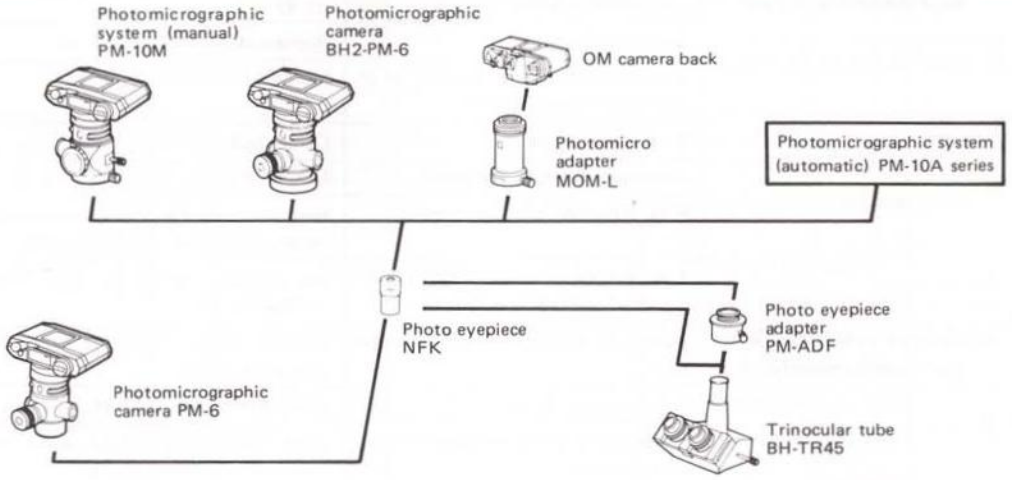


Fig. 18

5 PHOTOMICROGRAPHY

The CK2 inverted microscope with the trinocular tube is qualified to be used with Olympus photomicrographic equipment PM-10AK (automatic), PM-10M (manual), Photomicrographic camera PM-6, OM camera backs, etc. Read the instruction manuals of each equipment for explanations in detail.
For quick reference, however, please refer to the following pointers:

5-1 Photomicrographic System and Optional Accessories



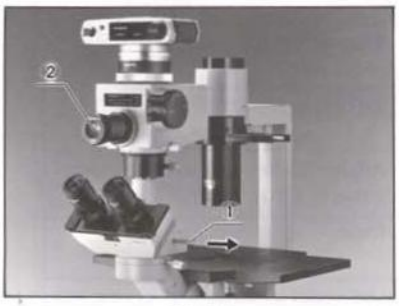


Fig. 19

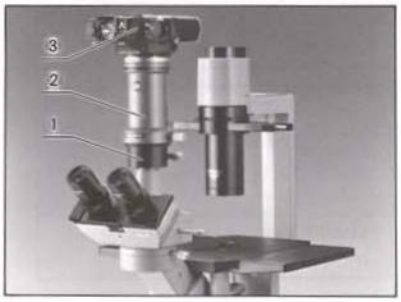


Fig. 20

1 Photomicrographic equipment PM-10AK

1) Set up the photomicrographic equipment PM-10AK. (Fig. 19)
2) Use NFK photo eyepieces 2.5X, 3.3X, 5X or 6.7X for photomicrography.
3) Pull out the light path selector lever ① to deflect the light to the photo tube.
4) Looking through the focusing telescope ②, focus on the specimen.
   ★ **In case of long time exposure, ambient light in the room will go through the eyepieces, and its image formed on the film plane may cause ghost or flare; to exclude this extraneous light, dim the room light or cap the eyepieces during photographic procedure.**

2 OM camera back

1) Mount the photo eyepiece adapter PM-ADF ① (into which a choice of NFK photo eyepiece is inserted), Photomicro adapter-L (MOM-L) ②, and OM camera back ③ on the photo tube in this order. (Fig. 20)
2) Bring the specimen into focus, looking through the viewfinder of the camera.
3) Photomicrographic magnification can be obtained by "Objective magnification" x "Photo eyepiece magnification".
   ★ **At high magnification photography (e.g. 20X, 40X), a photomicrographic image may blur due to the mirror lock-up shock and shutter vibration; we recommend to release the shutter at 1/2 second or slower speeds.**

6 TROUBLESHOOTING GUIDE

If you are unable to obtain full performance from your microscope, please consult the table below for pointers for trouble shooting:

Trouble	Cause	Remedy
1. Optical system		
a) With light source switched on, field of view is dark.	Bulb socket cord is not completely connected to lamp housing.	Check and tighten connection. (p. 4)
	Bulb is burned out.	Replace defective bulb. (p. 4)
	Bulb voltage selector knob is set at too low voltage position.	Increase bulb voltage. (p. 3)
	Bulb is not centered.	Center bulb. (p. 4)
	Too many filters are engaged.	Minimize filters in number. (p. 6)
	Fuse is burned out.	Remove cause for fuse burning and replace defective fuse. (2nd cover)
	Line voltage selector switch is not matched to local line voltage.	Set selector switch to local line voltage. (p. 4)
b) Field of view is cut off or illuminated unevenly.	Nosepiece is not clicked into position.	Slightly rotate nosepiece until it clicks in position.
	Filter stops midway.	Slide filter into correct position.
	Phase slider is not engaged in correct position.	Move slider completely until it clicks into position. (p. 7)
c) Dust or dirt is visible in field of view.	Dirty specimen	Clean specimen.
	Dust on eyepiece	Clean eyepiece front lens
d) Excessive image contrasts	Aperture iris diaphragm is stopped down too much.	Open aperture properly. (p. 6)
e) Resolution problems • Image is not sharp. • Insufficient contrast • Image details lack definition.	Objective is not correctly positioned in light path.	Slightly rotate nosepiece until it clicks into position. (p. 10)
	Aperture iris diaphragm is stopped down (or opened up) too much.	Adjust aperture properly. (p. 6)
	Correction collar is not adjusted.	Adjust collar correctly, checking image in focus. (p. 6)
	Dust on condenser lens, objective, eyepiece, and specimen vessel, etc.	Clean.
	Thickness of specimen slide, bottom of vessel, etc. is over 2 mm.	Use vessel of bottom thickness less than 2 mm. (p. 6)
• No effective phase contrast	Brightfield objective is used.	Use phase contrast objective. (p. 7)
	Light annulus of condenser is not matched with phase annulus of objective.	Use light annulus matching with objective. (p. 7)
	Light annulus and phase annulus are not concentric.	Center annuli correctly. (p. 7)

Trouble	Cause	Remedy
f) Specimen image is partially out of focus.	Objective is not fully engaged.	Slightly rotate nosepiece until it clicks into place. (p. 5)
	Specimen is not correctly placed on stage.	Place specimen correctly. (p. 6)
	Optical performance of specimen vessel (e.g. flatness of bottom) is insufficient.	Move specimen vessel to find proper position or replace. (p. 6)
g) Specimen image partially blurred.	Light source is not correctly centered.	Center light source correctly. (p. 4)
2. Electric system		
a) Light flickers and intensity is unstable.	Line voltage is unstable.	Use a voltage stabilizer.
	Filament of bulb is likely to burn out.	Replace defective bulb. (p. 4)
	Loose electric connection.	Tighten connection.
b) Fuse burns out too often.	Fuse is not a standard one.	Use a standard fuse. (2nd cover)
	Bulb is not a standard one.	Use 6V 20W halogen bulb as designated. (2nd cover)
c) Pilot lamp lights but illuminator bulb does not.	Bulb is burned out.	Replace defective bulb.
	No bulb is connected to bulb socket.	Connect bulb to socket.
	Cords or plugs are not connected.	Connect them completely.
3. Focusing		
a) Coarse adjustment knob is too tight.	Focus adjustment knobs are tightened too much.	Loosen adjustment knobs.
b) Specimen goes out of focus.	Focus adjustment knobs are loosened too much.	Tighten adjustment knobs.
4. Observation tube		
a) Incomplete binocular vision	Interpupillary distance is not correctly adjusted.	Adjust interpupillary distance. (p. 5)
	Diopter adjustment is incomplete.	Complete diopter adjustment. (p. 5)
	User is unaccustomed to binocular vision.	Prior to looking at specimen details, try to look at entire field of view, or look at a far away object before resuming microscopic observation. (p. 5)
5. Photomicrography		
a) Picture is out of focus.	Shutter speed of OM camera is faster than 1/2 second.	Prolong shutter speed by means of ND filters, etc. (p. 6)
b) Picture vignettes.	Achromatic objective is used.	Use Plan objective. (p. 7)
c) Focus is not sharp.	Correction collar of 40X objective is not adjusted.	Adjust correction collar according to thickness of vessel bottom. (p. 6)
d) Room window or fluorescent lamp is photographed.	Extraneous light enters eyepieces or focusing telescope.	Cap eyepieces or telescope. (p. 8)

MEMO

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